

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 989 695 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.03.2000 Bulletin 2000/13

(51) Int Cl.7: **H04H 1/00**

(21) Application number: **99307499.6**

(22) Date of filing: **22.09.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Kimoto, Masashi**
Shinagawa-ku, Tokyo (JP)

(74) Representative: **Nicholls, Michael John**
J.A. KEMP & CO.
14, South Square
Gray's Inn
London WC1R 5LX (GB)

(30) Priority: **24.09.1998 JP 26920098**

(71) Applicant: **SONY CORPORATION**
Tokyo (JP)

(54) **Receiver for receiving Digital Audio Broadcast (DAB) programmes**

(57) A receiver for digital audio broadcast in which plural programs and data of character sequences indicating broadcast stations are broadcasted through one transmission frequency band, including a past record table with which when the digital audio broadcast is received, the data of the reception frequency thereof and the data of the character sequence thereof are paired

and registered, and a display element for displaying a list of the character sequences indicating the broadcast stations on the basis of the data of the past record table, wherein when one of the character sequences in the list displayed on the display element is selected the broadcast is selected and received on the basis of the reception frequency data corresponding to the character sequence.

FIG. 1

ENSEMBLE	ENSEMBLE A			
	SERVICE			
SERVICE COMPONENT	SERVICE 1	SERVICE 2	SERVICE 3	SERVICE 4
	PROGRAM 1A (SERIAL NUMBER 1)	PROGRAM 2A (SERIAL NUMBER 1)	PROGRAM 3A (SERIAL NUMBER 1)	PROGRAM 4A (SERIAL NUMBER 1)
	PROGRAM 1B (SERIAL NUMBER 2)	PROGRAM 2B (SERIAL NUMBER 2)	PROGRAM 3B (SERIAL NUMBER 2)	PROGRAM 4B (SERIAL NUMBER 2)
	PROGRAM 1C (SERIAL NUMBER 3)	PROGRAM 2C (SERIAL NUMBER 3)	PROGRAM 3C (SERIAL NUMBER 3)	
	PROGRAM 1D (SERIAL NUMBER 4)		PROGRAM 3D (SERIAL NUMBER 4)	
	PROGRAM 1E (SERIAL NUMBER 5)		PROGRAM 3E (SERIAL NUMBER 5)	

EP 0 989 695 A2

Description

[0001] The present invention relates to a receiver for digital audio broadcast. As digital audio broadcast has been known DAB (Digital Audio Broadcasting) conforming to Eureka 147 standards). According to DAB, 64 programs of digital audio signals or digital data at maximum are simultaneously transmitted by using 1.5MHz as a transmission frequency band width, OFDM (Orthogonal Frequency Division Multiplex) as a modulation system and layer II of MPEG audio as data compression of audio signals.

[0002] Accordingly, in DAB, programs are set in a hierarchical structure as shown in Fig. 1 of the accompanying drawings. That is, as described above, DAB uses a transmission frequency band of 1.5MHz for one channel. This transmission channel is called as "ensemble", and an ensemble is selected by establishing synchronization with the central frequency of the ensemble concerned.

[0003] The ensemble is divided into groups each called as "service". In the case of Fig. 1, the ensemble is divided into four services. Each service is further divided into some "service components", and each service component is set as a digital audio signal or digital data constituting one program.

[0004] In this case, each service corresponds to a general broadcast station. For example, the services are used like a soccer game at a main site is broadcasted through a first service component, a soccer game at a second site is broadcasted through a second service component, a soccer game at a third site is broadcasted through a third service component, etc.

[0005] The ensemble and the service are provided with respective names which are called as "ensemble label" and "service label", and the data of character sequences representing these names are transmitted at the same time. With respect to the service component, there are two cases where the label is transmitted and where no label is transmitted.

[0006] A service ID for identification is further allocated to each service, and the service ID is transmitted at the same time. The service component is provided with a serial number every each service, and the serial number thus provided is transmitted.

[0007] Accordingly, when a user wishes to listen to a program of DAB, it is necessary for the user to carry out a process of selecting an ensemble (frequency), selecting one of plural services in the ensemble thus selected on the basis of a service ID and then selecting a desired service component (program) from the selected service on the basis of a serial number.

[0008] However, it is cumbersome and inconvenient for the user to carry out the above operation in order to listen to a broadcast program. Further, when the user listens to DAB while driving a car, it is cumbersome to carry out such an operation, and in some cases it may induce a traffic accident.

[0009] In view of the foregoing situation, there has been proposed a DAB receiver in which upon pushing a scan key, a broadcast frequency band is scanned to select ensembles in turn. Further, there has been also proposed another type DAB receiver in which upon pushing one of plural preset keys, an ensemble which is beforehand registered in association with the pushed key is selected and received.

[0010] However, in the case of the scan-selection type DAB receiver in which an ensemble is selected by a scan key, a user waits until his/her desired ensemble is selected. In the case of the preset type receiver in which an ensemble is selected by a preset key, it is necessary for the user to register ensembles in association with the respective preset keys in advance, and it needs an extra work.

[0011] Therefore, the present invention has been implemented in view of the foregoing situation,

[0012] An object of the present invention is to provide a digital audio broadcast receiver which can select a program immediately and facilitate the selection operation of the program.

[0013] Another object of the present invention is to provide a digital audio broadcast receiver which can omit an extra work of beforehand registering ensembles in association with preset keys as in the case of a preset type receiver.

[0014] In order to attain the above objects, according to an aspect of the present invention, there is provided a receiver for digital audio broadcast in which plural programs and data of character sequences indicating broadcast stations are broadcasted through one transmission frequency band, characterized by comprising: a past record table provided to a controller with which when the digital audio broadcast is received, the data of the reception frequency thereof and the data of the character sequence thereof are paired and registered; a display device for displaying a list of the character sequences indicating the broadcast stations on the basis of the data of the past record table; and the controller for controlling selection of the broadcast on the basis of the reception frequency data corresponding to a character sequence which is selected from the list displayed on the display device.

[0015] According to another aspect of the present invention, there is provided a receiver for digital audio broadcast in which plural programs are grouped, and the plural programs, the data representing the names of the groups and the data of the character sequences indicating broadcast stations are broadcasted through one transmission frequency band, characterized by comprising: a past record table provided to a controller with which when the digital audio broadcast is received, the data of the reception frequency thereof, the data of the character sequence thereof and the data corresponding to the name of the group thereof are assembled as a set and registered; a display device for displaying a list of the names of the groups on the basis of

the data of the data corresponding to the names of the groups in the past record table; and the controller for controlling selection of the broadcast on the basis of the reception frequency data corresponding to a name which is selected from the list displayed on the display device.

[0016] The invention will be further described by way of example with reference to the accompanying drawings, in which:-

Fig. 1 is a diagram showing a hierarchical structure according to the present invention;

Fig. 2 is a systematic diagram showing an embodiment of the present invention;

Fig. 3 is a flowchart showing the process flow according to the embodiment of the present invention;

Figs. 4(A) and 4(B) are tables in the present invention; and

Figs. 5(A), 5(B) and 5(C) are displays on a screen in the present invention.

[0017] A preferred embodiment according to the present invention will be described hereunder with reference to the accompanying drawings.

[0018] Fig. 2 is a systematic block diagram showing the construction of a receiver according to an embodiment of the present invention.

[0019] In Fig. 2, a broadcast wave signal of DAB is received by an antenna 11, and the signal thus received is supplied to a tuner circuit 12 which is designed in a superheterodyne structure to convert the signal to an intermediate frequency signal. Thereafter, the intermediate frequency signal is supplied to an A/D converter circuit 13 to be subjected to A/D (Analog-to-Digital) conversion, thereby obtaining a digital signal.

[0020] The digital signal thus obtained is supplied to an orthogonal demodulation circuit 14 to be decoded into data of an in-phase component (real-axis component) and an orthogonal component (imaginary-axis component), and these data are subjected to complex Fourier Transform in an FFT circuit 15 to output frequency components every symbol. The output of the FFT circuit 15 is supplied to a viterbi decoder circuit 16 to be subjected to deinterleave and error correction, and also digital audio data of a desired program (service component) are selected.

[0021] Subsequently, the data thus selected are supplied to an audio decoder circuit 17 to be subjected to decode processing such as MPEG data expansion, and the digital audio data of the desired program are picked up from the decoder circuit 17. Thereafter, the digital audio data thus picked up are supplied to a D/A converter circuit 18 to be D/A-converted to analog audio signals L, R, and then the signals L, R are supplied to amplifiers 19L, 19R to be amplified, and then supplied to speakers 21L, 21R to reproduce the original broadcast signal.

[0022] A microcomputer 31 is provided as a system controller. Since the tuner circuit 12 is generally de-

signed so that an ensemble (reception frequency) is selected by PLL, the data of a frequency division ratio N of a variable frequency dividing circuit in the PLL are supplied as frequency data for ensemble selection from the microcomputer 31 to the tuner circuit 12.

[0023] Further, selection signals SSV, SNO are supplied from the microcomputer 31 to the viterbi decoder circuit 16, a service is selected on the basis of the signal SSV, and digital audio data of a desired service component (program) are selected from the selected service on the basis of the signal SNO.

[0024] Data necessary to identify or specify a program, that is, the data of an ensemble label (representing the name of an ensemble), a service label (representing the name of a service), etc. are picked up from the viterbi decoder circuit 16, and then these data are supplied to the microcomputer 31.

[0025] The microcomputer 31 is provided with a selection routine 100 as shown in Fig. 3 as a part of the program which is to be executed in the microcomputer 31, through which a desired program (service component) is selected in the manner as described later.

[0026] The microcomputer 31 is further provided with a memory 32 comprising, for example, a flash memory or a RAM which is backed up by a battery (not shown). That is, the memory 32 comprises a non-volatile memory, and it can keep written data even when it is powered off.

[0027] For example, as shown in Fig. 4(A), the memory 32 is provided with a past record table HTBL having past records of programs which were previously received. That is, the table HTBL holds a plurality of sets each comprising the frequency division ratio N of the variable frequency dividing circuit in PLL of the tuner circuit 12, an ensemble label, a service ID, the serial number of a service component and a reception time as data when the program (service component) is received.

[0028] In addition, in the memory 32 are stored the frequency division ratio N of the variable frequency dividing circuit in PLL of the tuner circuit 12, the service ID and the serial number of the service component as the data of the last channel, that is, the data of a program to which a user was just previously listening when power was switched off.

[0029] The microcomputer 31 is connected to a time counting circuit 33 for counting the current time, various operation keys 34 serving as input means and LCD 35 for displaying various information, for example.

[0030] With the above construction, when the receiver is powered on, the processing of the microcomputer 31 is started from a step 101 of a routine 100 as shown in Fig. 3. Subsequently, in a step 102, the data of the last channel are read out from the memory 32 to select a program to which a user was listening at the time when the receiver was just previously powered off.

[0031] That is, out of the data thus read out, an ensemble for which the frequency division ratio N is set

in the variable frequency dividing circuit in PLL of the tuner circuit 12 and which was selected at the time when the power was just previously switched off is selected, a selection signal SSV indicating a service ID is supplied to the viterbi decoder circuit 16 to select a service, and then a selection signal SNO indicating the serial number of the service component is supplied to the viterbi decoder circuit 16 to select the service component. Through the above operation, the user can listen to the program to which the user was listening when the power was switched off.

[0032] Subsequently, the processing goes from the step 102 to a step 103 and waits in the step 103 until any key is input. Upon pushing any key under the standby state in which the processing waits for the key input, the following processing is executed in accordance with the type of the pushed (operated) key.

[When a desired program is selected by using the present invention]

[0033] In this case, the user pushes a list key out of the keys 34 under the standby state in which the processing waits for the key input in the step 103. The processing goes from the step 103 to a step 111 and it is judged in the step 111 where the type of the pushed key in the step 103 is the list key or not.

[0034] In the above case, since the pushed key is the list key, the processing goes from the step 111 to a step 121, and in the step 121 the data of the table HTBL are sorted so that ensemble labels (i.e., ensemble names) are arranged in forward order (for example, in alphabetical order or the like) while each set of respective data is packed as a unit as shown in Fig. 4(B).

[0035] Subsequently, the processing goes to a step 122 to supply the ensemble labels of the table HTBL to LCD 35, and the ensemble labels (names) of every eight stations are displayed in forward order on LCD 35 as shown in Fig. 5(A), for example. At this time, for example, a first ensemble label is displayed in such a manner as to be surrounded by a rectangular frame, which means a cursor 35C.

[0036] As described above, the names of the ensembles (ensemble labels) which were previously received are displayed in a list style in name order (e.g., alphabetical order) on LCD 35.

[0037] Subsequently, the processing goes to a step 123. In the step 123, the user is allowed to select any one of the ensembles whose names are displayed on LCD 35. That is, upon pushing a down cursor key out of the keys 34 in the display state shown in Fig. 5(A), the cursor 35C is shifted to a second ensemble label (name) as shown in Fig. 5(B). Upon further pushing the down cursor key, the cursor 35C is shifted to a third ensemble label as shown in Fig. 5(C).

[0038] As described above, the cursor 35C is shifted one by one every time the down cursor key is pushed once. If some ensemble labels are displayed beyond

one frame of LCD 35 (that is, all the ensemble labels cannot be perfectly displayed within one display frame), when the cursor 35C arrives at the lowermost line of the display frame, the remaining ensemble labels (which overflow from the display frame) are subsequently displayed by scrolling them. When an up cursor key out of the keys 34 is pushed, the cursor 35C is shifted in the opposite direction to the direction when the down cursor key is pushed.

[0039] For example, as shown in Fig. 5(B), when the cursor 35C is located at the second ensemble label "Ensemble B", upon pushing an enter key out of the keys 34, the ensemble of "Ensemble B" is selected and then the processing goes to a step 124.

[0040] By referring to the data table HTBL in the step 124, the frequency division ratio N which is paired with the ensemble label selected in the step 123 is picked up, and the frequency division ratio N thus picked up is set in the variable frequency dividing circuit in PLL of the tuner circuit 12. Accordingly, subsequently, the ensemble of the ensemble label selected in the step 123 is received. For example, if the "Ensemble B" is selected in the step 123, the frequency division ratio N paired with the "Ensemble B" is equal to a value N1, so that the value N1 is set in the variable frequency dividing circuit and the ensemble B thereof is received.

[0041] Subsequently, the processing goes to a step 125. In the step 125, by referring to the data table HTBL, the service ID paired with the ensemble label selected in the step 123 is picked up, and the selection signal SSV indicating the service ID is supplied to the viterbi decoder circuit 16 to select the corresponding service. For example, if "Ensemble B" is selected in the step 123, the service ID paired with the "Ensemble B" is equal to a value ID7 and thus the selection signal SSV indicating the service ID (ID7) is supplied to the viterbi decoder circuit 16 to select the service of the service ID (ID7).

[0042] Further, the processing goes to a step 126. In the step 126, by referring to the data table HTBL, the serial number paired with the ensemble label selected in the step 123 is picked up, and the selection signal SNO indicating the serial number is supplied to the viterbi decoder circuit 16 to select the service component of the corresponding serial number. For example, if the "Ensemble B" is selected in the step 123, the serial number paired with the "Ensemble B" is equal to a value 2, and thus the selection signal SNO indicating the serial number 2 is supplied to the viterbi decoder circuit 16 to select the second service component in the service of the service ID (ID7).

[0043] In the step 126, if the broadcast of the corresponding program is finished (the service component is not broadcasted), the program having the first serial number in the same service is selected.

[0044] Accordingly, at the time when this step 126 is executed, the service component (program) of the service in the ensemble selected in the step 123 out of the reception past records preserved in the data table HTBL

is selected, and then the user can listen to the program.

[0045] Subsequently, the processing goes to a step 127. In the step 127, the reception time paired with the ensemble label selected in the step 123 out of the data of the table HTBL is renewed on the basis of the current time indicated by the time counting circuit 33. Thereafter, in a step 128, the frequency division ratio N of the variable frequency dividing circuit in PLL of the tuner circuit 12 which is currently carrying out the reception operation, the service ID and the serial number of the service component are stored as the data of the last channel into the memory 32. The data thus stored are read out and used in the step 102 when the power is afterwards switched off and then switched on.

[0046] Thereafter, the processing returns to the step 103 and then waits for the key input again.

[0047] Accordingly, when the list key is pushed under the key input standby state in the step 103, the list of the ensembles which were previously received is displayed on LCD 35. By selecting any ensemble from the list of the ensembles thus displayed, the user can listen to the program of the ensemble.

[When program selection is carried out by a general method]

[0048] In this case, in the step 103 the key corresponding to a desired selection method out of the keys 34 is pushed when the processing waits for the key input.

[0049] Thereafter, the processing goes from the step 103 to a step 111. In this case, since the key is not the list key, the processing goes from the step 111 to a step 112, and it is judged in the step 112 whether the pushed key is a key relevant to the program selection. In this case, the key is the relevant key, and thus the processing goes from the step 112 to a step 131.

[0050] In the step 131, the program selection is carried out by the same method as a general DAB receiver in accordance with the selection method of the program for which the key input is carried out in the step 103. For example, a scan operation is carried out or a different program (service component) of the same ensemble is selected. Thereafter, the processing goes to a step 132 and the table HTBL is renewed in the step 132.

[0051] That is, if a set of the frequency division ratio N of the variable frequency dividing circuit in PLL of the tuner circuit 12 under reception operation, the service ID and the serial number of the service component exists in the data of the table HTBL, the reception time thereof is renewed on the basis of the current time indicated by the time counting circuit 33. Further, if any set of the frequency division ratio N of the variable frequency dividing circuit in PLL of the tuner circuit 12 under reception operation, the service ID and the serial number of the service component does not exist in the data of the table HTBL, it is paired with the current time indicated by the time counting circuit 33 and newly reg-

istered in the table HTBL. At this time, if the empty capacity of the memory 32 is lack, a set of data having the oldest reception time is deleted.

[0052] Subsequently, the processing goes to a step 128 to renew the data of the last channel of the memory 32, and then the processing returns to the step 103 to wait for the key input again.

[0053] Accordingly, upon operating (pushing) a key for the program selection other than the list key in the state where the key input is set in the step 103, the program corresponding to the key operation is selected, and the user can listen to the program.

[Other processing]

[0054] Upon pushing the key corresponding to desired processing out of the keys 34 when the key input standby state is set in the step 103, the processing of the microcomputer 31 goes from the step 103 through the step 111 and the step 112 to a step 141 to execute target processing, for example, processing of controlling the signal level of the amplifiers 19L, 19R to alter the volume, and then the processing returns to the step 103 to wait for the key input again.

[0055] According to the receiver shown in Fig. 2, a list of ensembles which were previously received is displayed on LCD 35, and any ensemble is selected from the ensembles thus displayed, whereby the user can listen to the program. Accordingly, the ensemble can be just immediately selected, and the selection of the ensemble is easy. Further, it is unnecessary that ensembles are registered in advance as in the case of a preset type receiver, and thus no extra time is needed.

[0056] In the foregoing description, the data of the table HTBL are sorted and displayed in order of ensemble labels in the steps 121, 122. However, the data may be sorted in order of N-value or reception time so as to be displayed in increasing order of frequency or in order of reception time from newest to oldest. Further, a selection frequency for each ensemble may be counted to sort and display the ensembles in decreasing order of the count result.

[0057] In the foregoing description, when the list of the ensembles is displayed, the data of the table HTBL are sorted in the step 121. However, the data may be sorted when the data of the table HTBL are altered. Further, the user may be allowed to beforehand select items when the data of the table HTBL are sorted.

[0058] In DAB the frequency information of other ensembles broadcasted is simultaneously transmitted, so that the frequency information or the corresponding ensemble labels can be also displayed in the step 122. In this case, the ensembles indicated by the frequency information may not be actually received because of a geographical condition or reception antenna state. Therefore, the display of the ensembles is carried out with varying the display mode from the display based on the data of the table HTBL, for example by attaching an iden-

tification mark to the ensembles, changing the display color, or grouping and displaying these ensemble labels so as to discriminate these ensemble labels from the group of the ensemble labels of the table HTBL.

[0059] Further, the processing may be executed in accordance with a user's instruction or automatically so as to gain the frequency information of all the broadcasts receivable at a current reception place and contain the frequency information or the ensemble labels thereof in the display of the step 122. In this case, the display mode for the ensemble labels of ensembles which are not actually received may be made different from that of the display based on the data of the table HTBL.

[0060] When the ensemble label of an ensemble which is not actually received is contained in the display of the step 122, if the ensemble can be received, the display mode of the ensemble label may be set to that of the display based on the data of the table HTBL.

[0061] Further, if the service labels are preserved together in the table HTBL, the service labels could be displayed in the same manner as the display of the ensemble labels as described above.

[0062] In the case of DAB, a service is provided with an identifier which is called as a program type and indicates a music genre, and thus the display may be grouped on the basis of the identifier. Further, when the language is different every service, an identifier indicating the language is added every service, and thus the display can be grouped every language.

[0063] Further, when the table HTBL is renewed, the service label can be renewed. In this case, only a music piece and a language of desired genre can be selectively displayed in a list of service labels by performing filter processing on the basis of the identifier. In this case, plural identifiers may be subjected to the filter processing. Further, not only the user can set the filter for the filter processing, but also the microcomputer 31 may set it on the basis of past reception records.

[0064] According to the present invention, the program can be immediately selected, and the selection is easily performed. Further, it is unnecessary that the ensembles are beforehand registered as in the case of the preset type receiver, and thus no extra time is needed.

Claims

1. A receiver for digital audio broadcast in which plural programs and data of character sequences indicating broadcast stations are broadcasted through one transmission frequency band, characterized by comprising:

a past record table provided to a controller with which when the digital audio broadcast is received, the data of the reception frequency thereof and the data of the character sequence thereof are paired and registered;

a display element for displaying a list of the character sequences indicating the broadcast stations on the basis of the data of said past record table; and

said controller for controlling selection of the broadcast on the basis of the reception frequency data corresponding to a character sequence which is selected from the list displayed on said display element.

2. The receiver for the digital audio broadcast as claimed in claim 1, wherein the character sequences to be displayed on said display element are displayed in order of the reception frequency of the broadcast in said past record table.
3. The receiver for the digital audio broadcast as claimed in claim 1, wherein the character sequences to be displayed on said display element are displayed in order of the character sequences in said past record table.
4. The receiver for the digital audio broadcast as claimed in claim 1, wherein the character sequences are displayed on said display element in order of items selected by a user.
5. The receiver for the digital audio broadcast as claimed in claim 1, 2, 3 or 4 wherein when the character sequences are displayed on said display element, information on broadcast stations which can be received, information on broadcast stations which were previously received, and information of other frequencies transmitted through the broadcast are simultaneously displayed while being divided in accordance with a display mode.
6. A receiver for digital audio broadcast in which plural programs are grouped, and the plural programs, the data representing the names of the groups and the data of the character sequences indicating broadcast stations are broadcasted through one transmission frequency band, characterized by comprising:

a past record table provided to a controller with which when the digital audio broadcast is received, the data of the reception frequency thereof, the data of the character sequence thereof and the data corresponding to the name of the group thereof are assembled as a set and registered;

a display device for displaying a list of the names of the groups on the basis of the data corresponding to the names of the groups in the past record table; and

said controller for controlling selection of the broadcast on the basis of the reception fre-

quency data corresponding to a name which is selected from the list displayed on the display device.

7. The receiver for the digital audio broadcast as claimed in claim 6, wherein the names of the groups to be displayed on said display element are displayed in order of the reception frequency of the broadcast in said past record table. 5
8. The receiver for the digital audio broadcast as claimed in claim 6, wherein the names of the groups to be displayed on said display element are displayed in order of the group names in said past record table. 10
9. The receiver for the digital audio broadcast as claimed in claim 6, wherein the names of the groups to be displayed on said display element are displayed in accordance with the type of the program. 15
10. The receiver for the digital audio broadcast as claimed in claim 6, wherein the names of the groups to be displayed on said display element are displayed in order of items selected by a user. 20

30

35

40

45

50

55

FIG. 1

ENSEMBLE	ENSEMBLE A			
	SERVICE 1	SERVICE 2	SERVICE 3	SERVICE 4
SERVICE COMPONENT	PROGRAM 1A (SERIAL NUMBER 1)	PROGRAM 2A (SERIAL NUMBER 1)	PROGRAM 3A (SERIAL NUMBER 1)	PROGRAM 4A (SERIAL NUMBER 1)
	PROGRAM 1B (SERIAL NUMBER 2)	PROGRAM 2B (SERIAL NUMBER 2)	PROGRAM 3B (SERIAL NUMBER 2)	PROGRAM 4B (SERIAL NUMBER 2)
	PROGRAM 1C (SERIAL NUMBER 3)	PROGRAM 2C (SERIAL NUMBER 3)	PROGRAM 3C (SERIAL NUMBER 3)	
	PROGRAM 1D (SERIAL NUMBER 4)		PROGRAM 3D (SERIAL NUMBER 4)	
	PROGRAM 1E (SERIAL NUMBER 5)		PROGRAM 3E (SERIAL NUMBER 5)	

FIG. 2

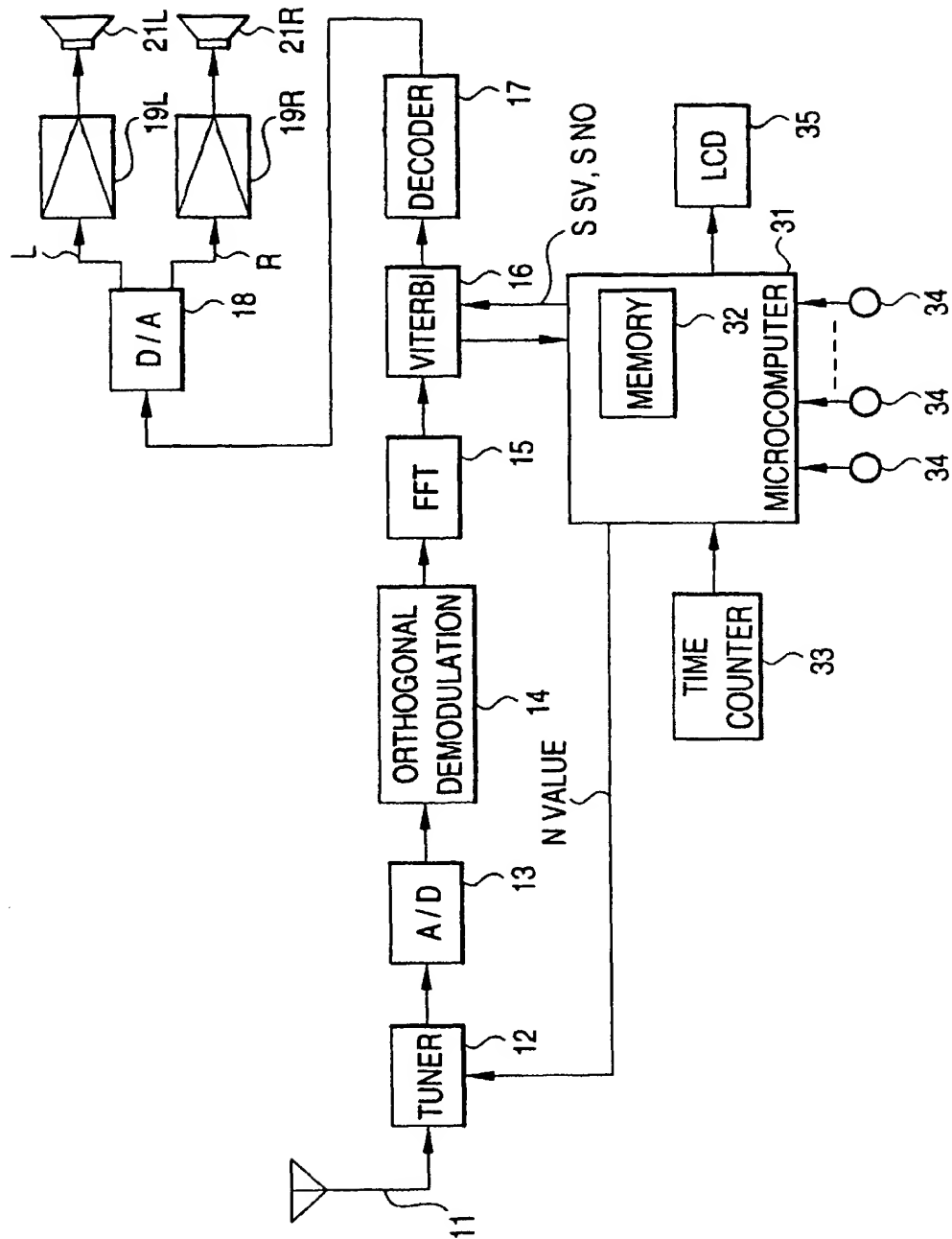


FIG. 3

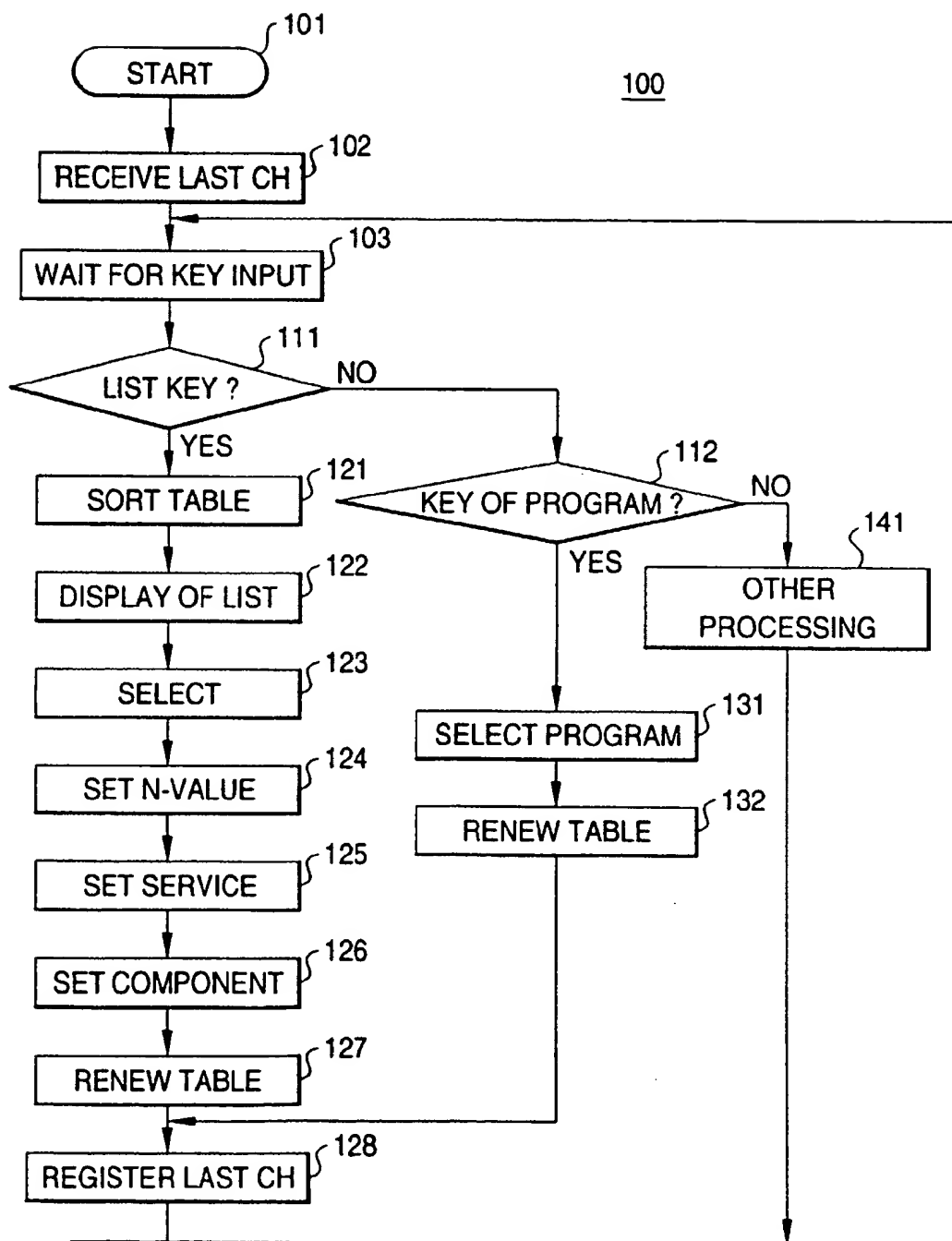


FIG. 4 (A)

N-VALUE	ENSEMBLE LABEL	SERVICE ID	SERIAL NUMBER	RECEPTION TIME
N 1	ENSEMBLE B	ID 7	2	hh 3 : mm 5
N 4	ENSEMBLE E	ID 3	7	hh 1 : mm 9
N 2	ENSEMBLE A	ID 2	1	hh 4 : mm 2
N 3	ENSEMBLE C	ID 5	8	hh 1 : mm 6
⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮

HTBL

FIG. 4 (B)

N-VALUE	ENSEMBLE LABEL	SERVICE ID	SERIAL NUMBER	RECEPTION TIME
N 2	ENSEMBLE A	ID 2	1	hh 4 : mm 2
N 1	ENSEMBLE B	ID 7	2	hh 3 : mm 5
N 3	ENSEMBLE C	ID 5	8	hh 1 : mm 6
N 9	ENSEMBLE D	ID 1	3	hh 2 : mm 4
⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮

HTBL

